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October 11, 2000

525 Rec'd PCT/PTO 11 OCT 2000  
09/673143

**BOX PCT**

Assistant Commissioner for Patents  
Washington, D.C. 20231

PCT/PCT/FR00/00489  
-filed February 28, 2000

Re: Application of Madeline PRIGENT, Pascal AMIGOUET  
POWER CABLE COMPRISING AT LEAST A NANOCOMPOSITE COMPONENT  
COATING LAYER  
Our Ref: Q60989

Dear Sir:

The following documents and fees are submitted herewith in connection with the above application for the purpose of entering the National stage under 35 U.S.C. § 371 and in accordance with Chapter I of the Patent Cooperation Treaty:

- ☒ an executed Declaration and Power of Attorney.
- ☒ an English translation of the International Application.
- ☒ 1 sheet of formal drawings.
- ☐ an English translation of Article 19 claim amendments.
- ☐ an English translation of Article 34 amendments (annexes to the IPER).
- ☒ an executed Assignment and PTO 1595 form.
- ☒ an Information Disclosure Statement with form PTO-1449 listing the ISR references, and a complete copy of each reference.
- ☒ a Preliminary Amendment

It is assumed that copies of the International Application, the International Search Report, the International Preliminary Examination Report, and any Articles 19 and 34 amendments as required by § 371(c) will be supplied directly by the International Bureau, but if further copies are needed, the undersigned can easily provide them upon request.

**BEFORE CALCULATING THE FEE, PLEASE SEE THE ATTACHED PRELIMINARY AMENDMENT** The Government filing fee is calculated as follows:

Total claims	12	-	20	=		x	\$18.00	=	\$0.00
Independent claims	1	-	3	=		x	\$80.00	=	\$0.00
Base Fee									\$860.00

**TOTAL FILING FEE**

Recordation of Assignment

**TOTAL FEE**

\$860.00
\$40.00
<hr/> \$900.00

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SUGHRUE, MION, ZINN, MACPEAK & SEAS, PLLC

Assistant Commissioner of Patents  
Washington, D.C. 20231  
Page 2  
Attorney Docket Q60989  
October 11, 2000

Checks for the statutory filing fee of \$860.00 and Assignment recordation fee of \$40.00 are attached. You are also directed and authorized to charge or credit any difference or overpayment to said Account. The Commissioner is hereby authorized to charge any fees under 37 C.F.R. §§ 1.16, 1.17 and 1.492 which may be required during the entire pendency of the application to Deposit Account No. 19-4880. A duplicate copy of this transmittal letter is attached.

Priority is claimed from March 04, 1999 based on French Application No. 9902686.

Respectfully submitted,

  
David J. Cushing  
Registration No. 28,703

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Date: October 11, 2000

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of PCT/FR00/00489  
Madeline PRIGENT, et al. Attorney Docket Q60989  
Appln. No.: Group Art Unit:  
Filed: October 11, 2000 Examiner:  
For: POWER CABLE COMPRISING AT LEAST A NANOCOMPOSITE COMPONENT  
COATING LAYER

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents  
Washington, D.C. 20231

Sir:

Prior to examination, please amend the above-identified application as follows:

**IN THE SPECIFICATION:**

Page 1, after the title, insert the heading --Background of the Invention--.

after line 33, insert the heading --Summary of the Invention--.

Page 5, after line 19, insert the heading --Brief Description of the Drawings--.

after line 32, insert the heading --Detailed Description of the Invention--.

**IN THE CLAIMS:**

Claim 5, line 1, delete "any preceding claim", and insert --claim 1--.

Claim 8, line 1, delete "any preceding claim" and insert --claim 1--.

Claim 9, line 1, delete "any preceding claim" and insert --claim 1--.

Claim 10, line 2, delete "any of claims 1 to 7" and insert --claim 1--.

Claim 11, line 2, delete "any preceding claim" and insert --claim 1".

AMENDMENT  
Attorney Docket Q60989

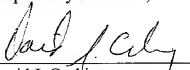
**IN THE ABSTRACT:**

After the heading "Abstract" delete the title.

**REMARKS**

Entry and consideration of this Amendment is respectfully requested.

Respectfully submitted,



David J. Cushing  
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Date: October 11, 2000

A POWER CABLE COMPRISING AT LEAST ONE NANOCOMPOSITE  
COMPONENT COVERING LAYER

The invention relates to a power cable having significantly improved mechanical, thermal, electrical or fire-resistance characteristics compared to the cables currently known in the art. The expression "power cable" refers to any electrical conductor intended to transport electrical energy and comprising at least one covering layer or sheath.

The invention relates more particularly to the material included in at least one of the covering layers placed around said electrical conductor.

Cablemakers are constantly concerned to improve the above characteristics of onboard cables and also to reduce their weight.

In addition to seeking to improve the characteristics of the materials used, cablemakers are on the lookout for solutions that can easily be integrated into existing production lines, such as production lines for fabricating cables by extruding molten polymers around the conductive core or for fabricating insulated wires by cross-linking a polymer in the liquid state or in solution.

The function of the covering is to protect the conductive core from external mechanical attack and ingress of moisture and to provide electrical insulation, if necessary. It must also provide sufficient fire resistance. At present most coverings include a continuous matrix, usually of polymer, and possibly containing particles of a charge, which may be an inorganic charge, such as the polymer/montmorillonite mixture for electrical cables described in Patent Application GB-A-2 113 453.

The object of the present invention is to propose a power cable in which the above characteristics are significantly improved by the presence of at least one covering layer into which a nanocomposite component that

can be used in existing industrial fabrication processes is introduced or polymerized in situ. A nanocomposite component of this kind is described in Patent Application WO-A-93/94 117, for example.

5 The invention provides a power cable comprising a conductive material core surrounded by at least one covering layer, the cable being characterized in that said layer is constituted essentially of a material comprising an inorganic compound of sheet structure and  
10 an organic compound inserted between the layers of said inorganic compound.

At present inorganic charges are frequently used in one cable covering layer or another, but the particle size of such charges is of the order of one micrometer (micron) and the charges are dispersed in a polymer and  
15 retain their original size after mixing with the polymer.

The present invention uses an inorganic compound of sheet structure such that an organic compound can be inserted between its layers after special treatment. The  
20 original particle size of the inorganic compound is of the order of one micron. When an organic compound is inserted between the layers, the inorganic compound is exfoliated to form a composite material. After insertion of the organic compound and exfoliation of the inorganic  
25 compound, the inorganic compound is distributed homogeneously within the composite material and has a particle size of the order of one nanometer. This significantly improves the existing properties of the material and introduces specific new properties. Said  
30 material is usually referred to as a nanocomposite material or component.

The expression "essentially constituted of" means that the layer can further include relatively smaller quantities of additives intended in particular to  
35 facilitate shaping it (plasticizers, lubricants, etc.), to retard aging (stabilizers, U.V. absorbers, flame retardants, anti-oxidizing agents, anti-impact agents,

etc.), or to modify its appearance (colored pigments, etc.).

The inorganic compound can be chosen from graphite or an inorganic oxide. Graphite is chosen if a conductive layer is required and an inorganic oxide is chosen if an electrically insulative layer is required. In this instance an oxide is preferably chosen. The inorganic oxide can be chosen from, for example, a silicate such as asbestos (hydrated silicate), feldspar (double silicate of aluminum and an alkaline or alkali-earth metal), a silicate of magnesium such as talc or steatite, or serpentine (magnesium silicate), a silico-aluminate such as mica (biotite, muscovite, phlogopite) or clay, alumina, titanate or zirconia, provided that it has a sheet structure.

The inorganic oxide is preferably a silicate and more preferably an aluminosilicate such as natural or artificial clay, possibly bridged. The clay preferably has a crystalline structure formed of stacked layers and preferably has OH<sup>-</sup> ions on the surface. The clay can be chosen from kaolin (dihydrated aluminum silicate), smectite, montmorillonite, bentonite, beidellite, nontronite, saponite, hectorite, vermiculite, wollastonite or a mixture of several clays.

In a preferred embodiment of the present invention, the clay chosen is montmorillonite, which is also known as "Fuller's earth" when it contains calcium or as bentonite when it contains sodium.

The organic compound inserted between the layers of the inorganic compound is preferably a polymer, an oligomer or a monomer that is polymerized in situ.

In a process of fabricating cables by extrusion, an extrudable polymer is used that can be chosen from a polyolefin such as polyethylene (PE) or polypropylene (PP), polybutylene terephthalate (PBTP), a vinyl polymer such as polyvinyl chloride (PVC), an elastomer (either halogenated or not), or a thermoplastics material,

silicone, copolymers thereof such as copolymers of ethylene, and a mixture of the above. Ethylene copolymers can be chosen from a copolymer of ethylene and vinyl acetate (EVA), a copolymer of ethylene and propylene (EPR), a copolymer of ethylene and an alkyl acrylate, such as the copolymer of ethylene and ethyl acrylate (EEA) or methyl acrylate (EMA), a copolymer of ethylene and acrylic acid, a terpolymer of ethylene, or the same polymers including specific functional groups (acids, epoxy, etc.).

In a process of fabricating cables using polymers in the liquid state, the polymer used is chosen from epoxy resin, polyester, a polyimide such as polyetherimide or polyamidimide, polyamide (PA), polyurethane, silicone, or a copolymer or mixture of the polymers previously cited.

The covering layer can be constituted exclusively of an insulative material.

The covering layer can be constituted of a layer of insulative material surrounded by an external protective covering layer.

The insulative material can be at least partly constituted of said nanocomposite material comprising an inorganic compound of sheet structure and an organic compound inserted between the layers of said inorganic compound.

The external covering layer can be at least partly constituted of said nanocomposite material comprising an inorganic compound of sheet structure and an organic compound inserted between the layers of said inorganic compound.

The cable can be a medium-voltage to high-voltage DC power cable, the covering layer comprising at least one semiconductor screen. The semiconductor screen can be essentially constituted of said nanocomposite material comprising an inorganic compound of sheet structure and an organic compound inserted between the layers of said inorganic compound.



The invention also provides a method of fabricating a cable as described above, including the following steps:

- treating the inorganic compound with an agent to render it compatible with the organic compound,

- mixing the treated inorganic compound with the organic compound at a temperature higher than the temperature at which the organic compound softens or melts, and

- obtaining the material with the organic compound inserted between the layers of the inorganic compound.

The inorganic compound is treated with a surfactant compatible with the organic compound to encourage insertion of the organic compound between the layers of the inorganic compound.

In one embodiment of the present invention, the inorganic compound is clay and the compatibilizing agent is chosen from a quaternary ammonium salt, an oxide of polyethylene and a phosphorus-containing derivative.

Other advantages and features of the present invention will emerge from the following description, which is given with reference to the accompanying drawing, in which:

Figure 1 is a diagrammatic representation in cross-section of an embodiment of a power cable of the present invention.

Figure 2 is a diagrammatic representation in cross-section of another embodiment of a power cable of the present invention.

Figure 3 is a diagrammatic representation in cross-section of a further embodiment of a power cable of the present invention.

The invention relates to a power cable 1 comprising a conductive material core 2 surrounded by a sheath 3 constituted of a covering layer 4.

According to the invention, the layer 4 is essentially constituted of a nanocomposite material

comprising an inorganic compound of sheet structure and an organic compound inserted between the layers of said inorganic compound.

5 Said inorganic compound can be graphite, for example, if a nanocomposite material having semiconductive properties is required.

10 In the embodiment shown in Figure 1, the resulting power cable 1, which is an insulated electrical wire, has significantly improved fire, water, and solvent resistance.

15 In the embodiment shown in Figure 2, the sheath 3 is constituted of an external protection covering 5 in addition to the insulative material layer 4. The insulative material layer 4 or the external covering 5 can be at least essentially constituted of said nanocomposite material.

20 The Figure 2 embodiment is typical of low-voltage AC cables. Integrating the nanocomposite material into the insulative material layer 4 and/or the external covering 5 significantly improves its mechanical, fire resistant, and flame retardant properties, and also its impermeability to water and to solvents.

25 In the embodiment shown in Figure 3, the power cable is a medium-voltage to high-voltage DC cable and the sheath 3 comprises at least one semiconductive screen 6a, 6b in addition to the insulative material layer 4 and the external protection covering 5. The semiconductive screen can be essentially constituted of said nanocomposite material.

30 The mechanism of forming the nanocomposite material and extruding it encourages an orientation of the organic compound, for example the polymer, which limits the migration of space charges.

35 Introducing a nanocomposite material into the insulative material layer 4 of a medium-voltage or high-voltage DC cable therefore improves the resistance of the cable to breakdown in the event of a change of polarity.

The mechanism of forming the nanocomposite material reduces the percolation threshold of the mixture, which significantly reduces the concentration of the organic compound in the inorganic compound. Using an internal  
5 semiconductive screen 6a constituted essentially of a nanocomposite material, for example a material based on graphite, therefore significantly improves the interface between the conductive core and the insulative layer.

Finally, introducing a nanocomposite material, for  
10 example a material based on a silicate or silicated clay, into the external semiconductor screen 6b and/or the external sheath 4 significantly improves its fire-resistance and flame propagation characteristics, and also its impermeability to water and to solvents.

Of course, the present invention is not limited to  
15 the embodiments described and shown, and is open to many variants that may suggest themselves to the skilled person and that are within the scope of the invention. In particular, the structure of the cables can be that of  
20 any power cable known in the art, and likewise inclusion of a nanocomposite material can be envisaged in any cable including an insulation, a semiconductive screen or a protective sheath.

## CLAIMS

1. A power cable comprising a conductive material core and at least one covering layer, characterized in that said layer is constituted essentially of a material comprising an inorganic compound of sheet structure and an organic compound inserted between the layers of said inorganic compound.
2. A power cable according to claim 1, wherein said inorganic compound is an inorganic oxide.
3. A power cable according to claim 2, wherein said inorganic oxide is clay chosen from kaolin, smectite, montmorillonite, bentonite, beidellite, nontronite, saponite, hectorite, vermiculite, wollastonite or a mixture thereof.
4. A power cable according to claim 3, wherein said clay is chosen from montmorillonite and bentonite.
5. A power cable according to any preceding claim, wherein said organic compound is a polymer, a monomer or an oligomer.
6. A power cable according to claim 5, wherein said polymer is chosen from a polyolefin, polybutylene terephthalate, a vinyl polymer, an elastomer, silicone, their copolymers and a mixture thereof.
7. A power cable according to claim 5, wherein said polymer is chosen from an epoxy resin, polyester, polyamide, polyimide, polyetherimide, polyamidimide, polyurethane, silicone or a mixture thereof.
8. A power cable according to any preceding claim, wherein the covering layer comprises an insulative material layer constituted essentially of a material

comprising an inorganic compound of sheet structure and an organic compound inserted between the layers of said inorganic compound.

- 5 9. A power cable according to any preceding claim, wherein the covering layer comprises an external covering layer constituted essentially of a material comprising an inorganic compound of sheet structure and an organic compound inserted between the layers of said inorganic compound.

- 10 10. A medium-voltage to high-voltage direct current power cable according to any of claims 1 to 7, wherein the covering layer comprises at least one semiconductor screen, characterized in that the semiconductor screen is constituted essentially of a material comprising an  
15 inorganic compound of sheet structure and an organic compound inserted between the layers of said inorganic compound.

- 20 11. A method of fabricating a power cable according to any preceding claim, including the production of said material by the following steps:
- treating said inorganic compound with an agent to render it compatible with said organic compound,
  - mixing the treated inorganic compound with said organic compound at a temperature higher than the  
25 temperature at which said organic compound softens or melts, and
  - obtaining said material with said organic compound inserted between the layers of said inorganic compound.

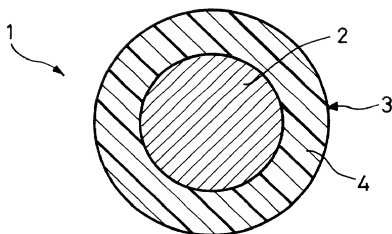
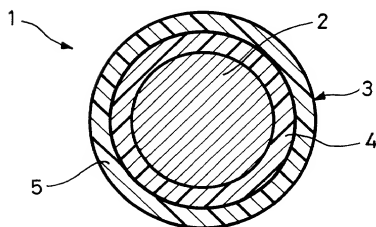
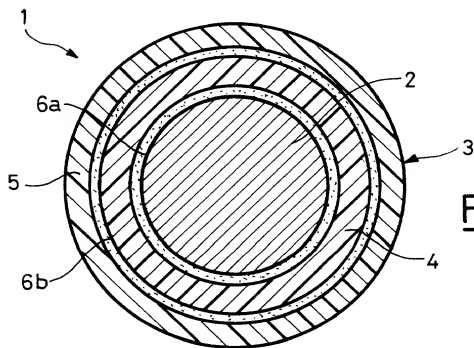
- 30 12. A method according to claim 11, wherein said inorganic compound is clay and said compatibilizing agent is chosen from a quaternary ammonium salt, and an oxide of polyethylene and a phosphorus-containing derivative.

## A B S T R A C T

A POWER CABLE COMPRISING AT LEAST ONE NANOCOMPOSITE  
COMPONENT COVERING LAYER

The invention relates to a power cable comprising a  
conductive material core and at least one covering layer,  
characterized in that said covering layer is constituted  
essentially of a material comprising an inorganic  
compound of sheet structure and an organic compound  
inserted between the layers of said inorganic compound.

Translation of the title and the abstract as they were when originally filed by the  
Applicant. No account has been taken of any changes that may have been made  
subsequently by the PCT Authorities acting ex officio, e.g. under PCT Rules 37.2,  
38.2, and/or 48.3.

FIG\_1FIG\_2FIG\_3

## Declaration and Power of Attorney for Patent Application

### Déclaration et Pouvoirs pour Demande de Brevet

#### French Language Declaration

En tant que l'inventeur nommé ci-après, je déclare par le présent acte que:

Mon domicile, mon adresse postale et ma nationalité sont ceux figurant ci-dessous à côté de mon nom.

Je crois être le premier inventeur original et unique (si un seul nom est mentionné ci-dessous), ou l'un des premiers co-inventeurs originaux (si plusieurs noms sont mentionnés ci-dessous) de l'objet revendiqué, pour lequel une demande de brevet a été déposée concernant l'invention de la description identifiée par le numéro de référence

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention in the specification identified by Docket No.

#### 101836/CD/ENR

Je déclare par le présent acte avoir passé en revue et compris le contenu de la description ci-dessus, revendications comprises.

Je reconnais devoir divulguer toute information pertinente à la brevetabilité, comme défini dans le Titre 37, § 1.56 du Code fédéral des réglementations.

Je revendique par le présent acte avoir la priorité étrangère, en vertu du Titre 35, § 119(a)-(d) ou § 365(b) du Code des Etats-Unis, sur toute demande étrangère de brevet ou certificat d'inventeur ou, en vertu du Titre 35, § 365(a) du même Code, sur toute demande internationale PCT désignant au moins un pays autre que les Etats-Unis et figurant ci-dessous et, j'ai aussi indiqué ci-dessous toute demande étrangère de brevet, tout certificat d'inventeur ou toute demande internationale PCT ayant une date de dépôt précédant celle de la demande à propos de laquelle une priorité est revendiquée.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56.

I hereby claim foreign priority under Title 35, United States Code, § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT International application which designated at least one country other than the United States, listed below, and have also identified below any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

Prior foreign application(s) for which priority is claimed

Demande(s) de brevet étrangère(s) antérieure(s) dont la priorité est revendiquée

(Number) (Numéro)	(Country) (Pays)	(Day/Month/Year Filed) (Jour/Mois/Année de dépôt)
99 02 686	FRANCE	04th MARCH 1999

Prior foreign applications for which priority is not claimed

Demande(s) de brevet étrangères antérieures(s) dont la priorité n'est pas revendiquée

(Number) (Numéro)	(Country) (Pays)	(Day/Month/Year Filed) (Jour/Mois/Année de dépôt)



## French Language Declaration

Je revendique par le présent acte tout bénéfice, en vertu du Titre 35, § 119(e) du Code des Etats-Unis, de toute demande de brevets provisoire effectuée aux Etats-Unis et figurant ci-dessous.

I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below.

(Application No.)  
(No de demande)

(Filing Date)  
(Date de dépôt)

Je revendique par le présent acte tout bénéfice, en vertu du Titre 35, § 120 du Code des Etats-Unis, de toute demande de brevet effectuée aux Etats-Unis, ou en vertu du Titre 35, § 365(c) du même Code, de toute demande internationale PCT désignant les Etats-Unis et figurant ci-dessous et, dans la mesure où l'objet de chacune des revendications de cette demande de brevet n'est pas divulgué dans la demande antérieure américaine ou internationale PCT, en vertu des dispositions du premier paragraphe du Titre 35, § 112 du Code des Etats-Unis, je reconnais devoir divulguer toute information pertinente à la brevetabilité, comme défini dans le Titre 37, § 1.56 du Code fédéral des réglementations, dont j'ai pu disposer entre la date de dépôt de la demande antérieure et la date de dépôt de la demande nationale ou internationale PCT de la présente demande.

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s), or § 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

(Application No.)  
(N° de demande)

(Filing Date)  
(Date de dépôt)

(Status)(patented, pending, abandoned)  
(Statut)(breveté, en cours d'examen, abandonné)

Je déclare par le présent acte que toute déclaration ci-incluse est, à ma connaissance, véridique et que toute déclaration formulée à partir de renseignements ou de suppositions est tenue pour véridique; et de plus, que toutes ces déclarations ont été formulées en sachant que toute fausse déclaration volontaire ou son équivalent est passible d'une amende ou d'une incarcération, ou des deux, en vertu de la Section 1001 du Titre 18 du Code des Etats-Unis, et que de telles déclarations volontairement fausses risquent de compromettre la validité de la demande de brevet ou du brevet délivré à partir de celle-ci.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

# French Language Declaration

POUVOIRS: En tant que l'inventeur cité, je désigne par la présente l'(es) avocat(s) et/ou agent(s) suivant(s) pour qu'ils poursuive(nt) la procédure de cette demande de brevet et traite(nt) toute affaire s'y rapportant avec l'Office des brevets et des marques: (mentionner le nom et le numéro d'enregistrement).

John H. Mion, Reg. No. 18,879; Thomas J. Macpeak, Reg. No. 19,292; Robert J. Seas, Jr., Reg. No. 21,092; Darryl Mexic, Reg. No. 23,065; Robert V. Sloan, Reg. No. 22,775; Peter D. Olexy, Reg. No. 24,513; J. Frank Osha, Reg. No. 24,625; Waddell A. Biggart, Reg. No. 24,861; Louis Gubinsky, Reg. No. 24,835; Neil B. Siegel, Reg. No. 25,200; David J. Cushing, Reg. No. 25,703; John R. Inge, Reg. No. 26,916; Joseph J. Ruch, Jr., Reg. No. 26,577; Sheldon I. Landsman, Reg. No. 25,430; Richard C. Turner, Reg. No. 29,710; Howard L. Bernstein, Reg. No. 25,665; Alan J. Kasper, Reg. No. 25,426; Kenneth J. Burchfiel, Reg. No. 31,333; Gordon Kit, Reg. No. 30,764; Susan J. Mack, Reg. No. 30,951; Frank L. Bernstein, Reg. No. 31,484; Mark Boland, Reg. No. 32,197; William H. Mandir, Reg. No. 32,156; Scott M. Daniels, Reg. No. 32,562; Brian W. Hannon, Reg. No. 32,778; Abraham J. Rosner, Reg. No. 33,276; Bruce E. Kramer, Reg. No. 33,725; Paul F. Neils, Reg. No. 33,102; and Brett S. Sylvester, Reg. No. 37,765; and Robert M. Masters, Reg. No. 35,603.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: (list name and registration number)

Adresser toute correspondance à:

Send Correspondence to:  
SUGHRUE, MION, ZINN, MACPEAK & SEAS, PLLC  
2100 Pennsylvania Avenue, N.W., Suite 800  
Washington, D.C. 20037-3213

Nom complet de l'unique ou premier inventeur	Full name of sole or first inventor (First Middle Last) Madeleine PRIGENT
Signature de l'inventeur	Inventor's signature 1-00 Prigent
Date	Date 15/12/10
Domicile	Residence 91460 MARCOUSSIS, FRANCE FR
Nationalité	Citizenship French
Adresse postale	Post Office Address 10, Avenue des Fraîches 91460 MARCOUSSIS, FRANCE
Nom complet du second co-inventeur, le cas échéant	Full name of second joint inventor, if any (First Middle Last) Pascal AMIGOUET 2-00
Signature du second inventeur	Second inventor's signature 15-02-2010
Date	Date
Domicile	Residence BOISSY SAINT YON, FRANCE FR
Nationalité	Citizenship French
Adresse postale	Post Office Address 12, Rue George SAND 91790 BOISSY SAINT YON, FRANCE

(Fournir les mêmes renseignements et la signature de tout co-inventeur supplémentaire.)

(Supply similar information and signature for third and subsequent joint inventors.)